Name: ______________________________

GCSE (1 – 9)

Direct and Inverse Proportion

Instructions

- Use **black** ink or ball-point pen.
- Answer all questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- You must **show all your working out.**

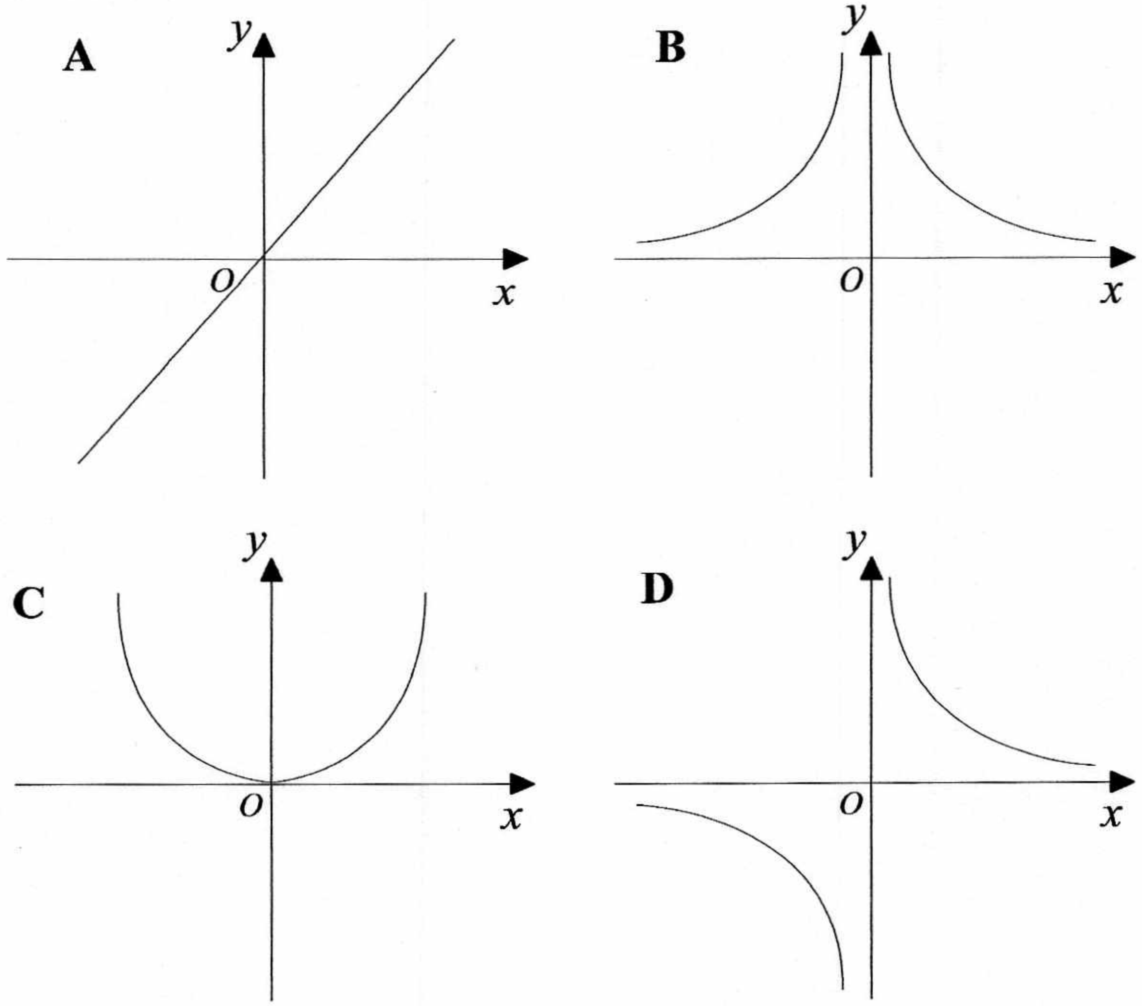
Information

- The marks for each question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end

1 Here are four graphs.



Match each graph with a statement in the table below.

Proportionality relationship	**Graph letter**
y is directly proportional to x	A
y is inversely proportional to x	D
y is directly proportional to x^2	C
y is inversely proportional to x^2	B

(Total for question 1 is 2 marks)

2 a is directly proportional to b

When $a = 7$, $b = 28$

Find the value of b when $a = 5$

$$a = kb$$
$$7 = k(28)$$
$$k = \frac{7}{28}$$
$$= \frac{1}{4}$$
$$\therefore a = \frac{1}{4}b$$

when $a = 5$

$$5 = \frac{1}{4}b$$
$$b = 20$$

$b =$ 20

(Total for question 2 is 3 marks)

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3 c is inversely proportional to d

When $c = 3$, $d = 8$

Find the value of c when $d = 2$

$$c = \frac{k}{d}$$
$$3 = \frac{k}{8}$$
$$k = 24$$
$$\therefore c = \frac{24}{d}$$

when $d = 2$

$$c = \frac{24}{2}$$
$$= 12$$

$c =$ 12

(Total for question 3 is 3 marks)

4 e is directly proportional to f

When $e = 3, f = 36$

Find the value of f when $e = 4$

$e = kf$

$3 = k(36)$

$k = \frac{3}{36}$

$= \frac{1}{12}$

$\therefore \; e = \frac{1}{12} f$

when $e = 4$

$4 = \frac{1}{12} f$

$f = 48$

$f =$ 48

(Total for question 4 is 3 marks)

5 g is directly proportional to the square root of h

When $g = 18$, $h = 16$

Find the possible values of h when $g = 2$

$g = k\sqrt{h}$

$18 = k\sqrt{16}$

$18 = k(4)$

$k = \frac{18}{4} = \frac{9}{2}$

$\therefore \; g = \frac{9}{2}\sqrt{h}$

when $g = 2$

$2 = \frac{9}{2}\sqrt{h}$

$4 = 9\sqrt{h}$

$\frac{4}{9} = \sqrt{h}$

$h = \frac{16}{81}$

$h =$ $\frac{16}{81}$

(Total for question 5 is 3 marks)

6 y is inversely proportional to x

When $y = 15$, $x = 4$

Find the value of y when $x = 12$

$$y = \frac{k}{x}$$

$$15 = \frac{k}{4}$$

$$60 = k$$

$$\therefore \quad y = \frac{60}{x}$$

when $x = 12$ $\quad y = \frac{60}{12}$

$$= 5$$

$y =$ ......5......

(Total for question 6 is 3 marks)

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7 x is inversely proportional to the square root of y

When $x = 12$, $y = 9$

Find the value of x when $y = 81$

$$x = \frac{k}{\sqrt{y}}$$

$$12 = \frac{k}{\sqrt{9}}$$

$$12 = \frac{k}{3}$$

$$k = 36$$

$$\therefore \quad x = \frac{36}{\sqrt{y}}$$

when $y = 81$ $\quad x = \frac{36}{\sqrt{81}} = \frac{36}{9} = 4$

$x =$ ......4......

(Total for question 7 is 3 marks)

8 y is inversely proportional to the cube of x

When $y = 250$, $x = 0.2$

Find the value of y when $x = 0.5$

$0.2 = \frac{1}{5}$

$(0.2)^3 = \frac{1}{125}$

$0.5 = \frac{1}{2}$

$0.5^3 = \frac{1}{8}$

$y = \frac{k}{x^3}$

$250 = \frac{k}{(0.2)^3}$

$250 = \frac{k}{(1/125)}$

$k = 2$

$\therefore \quad y = \frac{2}{x^3}$

when $x = 0.5$

$y = \frac{2}{(0.5)^3}$

$y = \frac{2}{1/8} = 16$

$y =$ ......16......

(Total for question 8 is 3 marks)

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9 x is directly proportional to the cube of y

When $x = 32$, $y = 0.4$

Find the value of y when $x = 256$

$0.4 = \frac{2}{5}$

$0.4^3 = \frac{8}{125}$

$x = ky^3$

$32 = k(0.4)^3$

$32 = \frac{8k}{125}$

$k = 500$

$\therefore \quad x = 500y^3$

when $x = 256$

$256 = 500y^3$

$\frac{256}{500} = y^3$

$y^3 = \frac{64}{125}$

$y = \frac{4}{5}$

$y =$ ......$\frac{4}{5}$......

(Total for question 9 is 3 marks)

10 The table shows pairs of values for x and y

x	2	3
y	32	72

(i) Tick the correct statement below.

$y = kx$
$32 = 2k$
$k = 16$
and
$72 = 3k$
$k = 24$
✗

$y = kx^2$
$32 = k(4)$
$k = 8$
and
$72 = k(9)$
$k = 8$ ✓

$y = kx^3$

$y \propto x$	....
$y \propto x^2$	✓
$y \propto x^3$	....

(ii) Write a formula for y in terms of x

$y = 8x^2$

$y = 8x^2$

(Total for question 10 is 4 marks)

11 The table shows pairs of values for x and y

x	4	5
y	256	500

(i) Tick the correct statement below.

$y = kx$
$256 = k(4)$
$k = 64$

$500 = k(5)$
$k = 100$

✗

$y = kx^2$
$256 = k(16)$
$k = 16$

$500 = k(25)$
$k = 20$

✗

$y = kx^3$
$256 = k(64)$
$k = 4$

$500 = k(125)$
$k = 4$

✓

$y \propto x$ ....

$y \propto x^2$ ....

$y \propto x^3$ ....✓.........

(ii) Write a formula for y in terms of x

$y = 4x^3$

$y = 4x^3$

(Total for question 11 is 4 marks)